Evolution of hot corinos and organics in Solar-type protostars

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The measurement of the abundance of both deuterated molecules and interstellar Complex Organic Molecules (iCOMs; C-bearing molecules containing at least six atoms) is a crucial step in understanding the possible formation of pre-biotic molecules in the interstellar medium and their delivery onto planetary systems around Sun-like stars. In addition, the deuterium fractionation can be used as fossil record of the physical conditions at the moment of the icy water and organics formation. Hot corinos are the typical laboratories where to study both iCOMs and deuterium fractionation. Indeed hot corinos are the inner 100 au envelopes around Sun-like protostars which are heated at temperatures larger than 100 K and where the dust mantles products enrich the gas chemical composition and trigger subsequent chemical gas-phase reactions.

In this talk, observations of iCOMs and deuterated species in Class 0 and Class I hot corinos will be presented. They are obtained using single-dish telescopes as the IRAM-30m as well as the new generation interferometers NOEMA and ALMA, in the framework of the large programs ASAI [1], SOLIS [2] and FAUST (PI:Yamamoto). The current observations contribute to fill in the gap between prestellar cores and protoplanetary disks, showing how the gas chemical content is modified during the early evolutionary stages of Sun-like star forming regions [3, 4]. In order to understand the possible heritage of iCOMs in our Solar System, the measurements are also compared to the recent observations of cometary material. Finally, iCOMs observations on Solar System spatial scales provide a precious tool to probe also the kinematics of the inner protostellar jet/disk system, tracing the interface between the infalling envelope and the self-gravitating rotating disk.

References

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